

Type 4746
Electric or Pneumatic Limit Switch



**Mounting and
Operating Instructions**

EB 8365 EN

Edition October 2013



Note on these mounting and operating instructions

These mounting and operating instructions (EB) assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

- ➔ For the safe and proper use of these instructions, read them carefully and keep them for later reference.
- ➔ If you have any questions about these instructions, contact SAMSON's After-sales Service department (aftersaleservice@samson.de).

Referenced documentation

The documents for the devices used in combination with the limit switch apply in addition to these mounting and operating instructions.

The mounting and operating instructions for all supplied devices are included in the delivery. The latest versions of the documents are available on our website at www.samson.de > Product documentation.

Definition of signal words



DANGER!

Hazardous situations which, if not avoided, will result in death or serious injury



NOTICE

Property damage message or malfunction



WARNING!

Hazardous situations which, if not avoided, could result in death or serious injury



Note:

Additional information



Tip:

Recommended action

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1 General safety instructions

For your own safety, follow these instructions concerning the mounting, start up and operation of the device:

- The device is to be mounted, started up or operated only by trained and experienced personnel familiar with the product.
According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- Explosion-protected versions of this device are to be operated only by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas. Refer to section 6.
- Any hazards that could be caused in the valve by the process medium and the operating pressure or by moving parts are to be prevented by means of appropriate measures.
If inadmissible motions or forces are produced in the pneumatic actuator as a result of the supply pressure level, it must be restricted using a suitable supply pressure reducing station.

To avoid damage to any equipment, the following also applies:

- Proper shipping and storage are assumed.

**Note:**

Positioners with a CE marking fulfill the requirements of the Directives 94/9/EC and 2004/108/EC.

The Declaration of Conformity is available on request.

2 Design and principle of operation

The limit switches are attached to pneumatic control valves as well as to Type 4765 and Type 4763 Positioners.

These limit switches have either inductive, electric or pneumatic contacts. They issue a signal when the valve travel exceeds or falls below a limit, especially when a control valve has reached its final position. This signal is transmitted, e.g. to an alarm or indicating system.

2.1 Principle of operation

The valve travel is transmitted either directly to the pin (1.1) and lever (1) of the limit switch by the plate (10) or by a coupling pin when a positioner is attached. The linear travel is converted into a rotary motion by the shaft (2).

2.1.1 Type 4746-x Inductive Limit Switch

In this version, the shaft (2) carries two switch cases (3) with adjustable metal tags (4.1) for non-contact activation of the integrated proximity switches (5). For the operation of inductive limit switches (except for Type 4746-0281), appropriate switch amplifiers must be integrated into the output circuit.

The switching function and switching point are continuously adjustable using the adjustment screw (3.1).

2.1.2 Type 4746-x3 Electric Limit Switch

In this version, the shaft (2) carries two switch cases (3) with adjustable cam disks (4.2). Each cam disk activates an electric double-throw switch (7) over the roller (6.1), which is attached to the switch lever (6). The switching function and switching point are continuously adjustable using the adjustment screw (3.1).

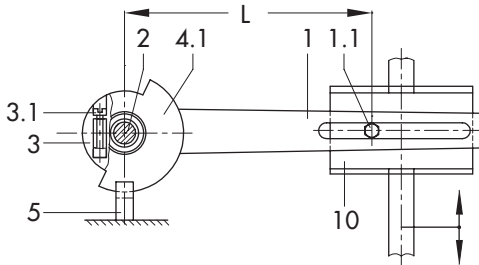
2.1.3 Type 4746-04 Pneumatic Limit Switch

In this version, the shaft (2) carries two switch cases (3) with adjustable cam disks (4.2). Each cam disk activates a nozzle/flapper system in the pneumatic switch (8).

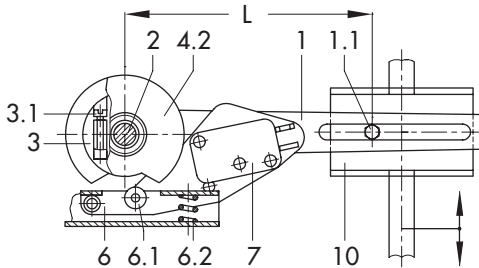
Whenever the cam disk (4.2) activates the switch lever (6) over the roller (6.1), the nozzle in the pneumatic switch (8) is opened and the supply air from the microswitch (9) is switched through to port A₁ or A₂.

The nozzle is closed in the pneumatic switch (8) and the supply air applied to the microswitch is cut off first when the cam disk has released the switch lever (6). As a result, pressure is no longer applied to port A₁ or A₂.

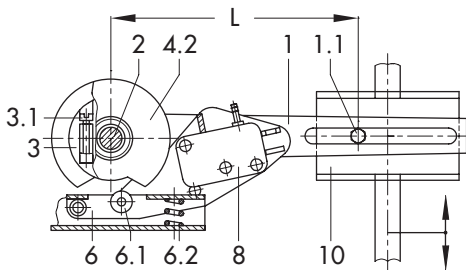
The switching function and switching point are continuously adjustable using the adjustment screw (3.1).



Inductive limit switch



Electric limit switch



Pneumatic limit switch with switching function

- 1 Lever for valve travel
- 1.1 Pin
- 2 Shaft
- 3 Switch case
- 3.1 Adjustment screw
- 4.1 Metal tag
- 4.2 Cam disk
- 5 Proximity switch
- 6 Switch lever
- 6.1 Roller
- 6.2 Spring
- 7 Electric switch
- 8 Pneumatic switch
- 8.1 Nozzle (in switch)
- 8.2 Flapper (in switch)
- 9 Pneumatic microswitch
- 10 Plate attached either to actuator stem or plug stem

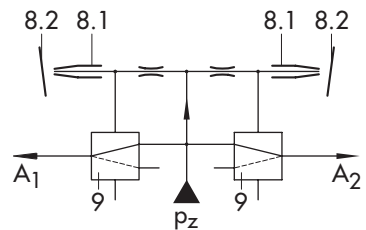


Fig. 1: Functional drawings

2.2 Article code and versions

Limit switch (device index .07 and higher)	Type 4746-	x	x	x	x	x	x	x	0	x	x	x	x
Explosion protection													
Without	0												
Ex II 2G Ex ia IIC T6 acc. to ATEX	1												
CSA/FM intrinsically safe/non incandive	3												
Ex II 3G Ex nA II T6 acc. to ATEX	8												
Type													
Inductive		2			1/2								
Electric		3			2								
Pneumatic	0	4			2								
Contacts													
Proximity switch SC3,5-N0-YE	0/1/8	2	0	0		1	0						
Proximity switch SJ3,5-SN		2	1	0		1	0						
Proximity switch SJ3,5-S1N		2	1	1		1	0						
SAIA, electric microswitch XGK 3		3	2	0	2	1	0						
SAIA, electric microswitch XGK3-81		3	2	1	2	1	0						
Pneumatic microswitch	0	4	4	0	2	0							
Proximity switch SB3,5-E2	0	2	8	1	2	1	0						
Switching elements													
With one switching element					1								
With two switching elements					2								
Electrical connection													
Without	0	4	4	0		0							
Plastic cable gland M20 x 1.5, black						1	0						
Pneumatic connections													
Without							0						
ISO 221/1-G 1/8	0	4	4	0		0	1						
1/8 -27 NPT	0	4	4	0		0	2						
Special versions													
Without									0	0	0		
NEPSI approval Ex ia, Type 4746-12 inductive	1	2	2						0	0	9		
NEPSI approval Ex nL, Type 4746-82 inductive	8	2	2						0	1	0		
GOST approval Ex ia, Type 4746-1...	1	2/3							0	1	3		
KOSHA approval Ex ia	1	2/3							0	1	5		
INMETRO approval, Ex ia	1	2/3							0	1	7		
Compatibility with paint													
Without													0
Free from substances that impair paint adhesion													1


Limit switch (device index .06 or lower)	Type 4746-	x	x	x	x
Type					
Inductive, no explosion protection	1				
Inductive, Ex ib IIC T6	2				
Electric	3				
Pneumatic	4				
Electrical connection/lever					
Without		0			
Cable gland, lever I (device index .04 or higher without lever)		1			
Cable gland, lever II for positioner attachment		2			
½" USA cable gland, lever I		3			
½" USA cable gland, lever II for positioner attachment		4			
Contacts					
SJ3,5-N			0		
SJ3,5-SN			1		
SAIA electric microswitch XGK 3			2		
Pneumatic microswitch with ISO 228/1-G ⅜ connecting thread			3		
Pneumatic microswitch with ⅜-27 NPT connecting thread			4		
SJ3,5-N (white dot of paint), max. hysteresis with 100 mm lever = 0.6 mm			5		
Microswitch (gold contacts)			6		
SJ3,5-E2 with LED (three-wire switch) without explosion protection, NO contact	1		8		
SB3,5-E2 (three-wire switch) without explosion protection, NO contact	1		9		
Switching elements					
With one switching element				1	
With two switching elements				2	

**Note:**

When replacing devices with index .00 to .03, a mounting unit with lever must also be ordered. See section 2.4.

2.3 Technical data

Inductive Limit Switch	Type 4746-x2			Type 4746-0281
Control circuit	Switching amplifier according to EN 60947-5-6			Three-wire switch Operating voltage 10 to 30 V
Proximity switch	SC3,5-N0-YE ²⁾	SJ3,5-SN	SJ3,5-S1N	SB3,5-E2
Permissible ambient temperature ¹⁾	-20 to 70 °C	-20 to 100 °C	-20 to 100 °C	-20 to 70 °C
with metal cable gland	-40 to 70 °C	-50 to 100 °C	-40 to 100 °C	-25 to 70 °C
Electrical connections	One M20x1.5 cable gland for 5.5 to 13 mm clamping range Screw terminals for 0.2 to 2.5 mm ² wire cross-section			
Degree of protection	IP 65			
Weight	Approx. 0.7 kg			
Type 4746-x3 Electric Limit Switch · Specifications apply to silver and gold-plated contacts				
Switching element	Electric limit switch: changeover/SPDT (single-pole/double-throw type)			
Permissible load	AC voltage: 220 V, 6.9 A DC voltage: 220 V, 0.25 A · 20 V, 6.9 A			
Permissible ambient temperature ¹⁾	-20 to 85 °C			
with metal cable gland	-40 to 85 °C			
Electrical connections	One M20x1.5 cable gland for 5.5 to 13 mm clamping range Screw terminals for 0.2 to 2.5 mm ² wire cross-section			
Degree of protection	IP 65			
Weight	Approx. 0.7 kg			
Type 4746-04 Pneumatic Limit Switch				
Switching element	Pneumatic limit switch with downstream pneumatic microswitch			
Supply air	1.4 bar (20 psi), can be briefly overloaded up to 4 bar (60 psi)			
Air consumption	0.04 m _n ³ /h			
Output	0 or 1.4 bar (20 psi)			
Air capacity	One switch closed: 0.7 m _n ³ /h · Two switches closed: 1.0 m _n ³ /h			
Permissible ambient temperature	-20 to 60 °C			
Degree of protection	IP 54			
Weight	Approx. 0.75 kg			
Materials				
Housing and cover	Powder-coated aluminum			
Lever and shaft	1.4571			
Cable gland	M20x1.5, black polyamide			

Travel range	
Attachment according to IEC 60534-6 (NAMUR)	Lever I: 7.5 to 60 mm · Lever II: 60 to 180 mm
Attachment to Type 4763 and Type 4765 Positioner	Travel same as positioner
Compliance	

- 1) Observe the limits specified in the EC-type examination certificate.
2) Models manufactured until 2006 with SJ3,5-N proximity switch.

Type 4746-1 with type of protection Ex ia (ATEX)





Maximum values for connection to certified intrinsically safe circuits








Limit Switch	Type 4746-12		Type 4746-13
Limit contacts	Inductive		Electric
U _i	16 V	16 V	45 V
I _i	52 mA	25 mA	–
P _i	169 mW	64 mW	2 W
C _i - effective inner capacitance	60 nF	50 nF	Negligibly small
L _i - effective internal inductance	160 µH	250 µH	
Temperature classes	Ambient temperature range according to EC-type examination certificate (technical data specified in above table additionally apply)		
T4	–45 to 80 °C	–45 to 100 °C	–45 to 80 °C
T5	–45 to 70 °C	–45 to 81 °C	–45 to 70 °C
T6	–45 to 60 °C	–45 to 66 °C	–45 to 60 °C

2.4 Accessories

Accessories for attachment according to IEC 60534-6				
Valve	Cast yoke (NAMUR rib) (see section 3.1)		Rod-type yoke (18 to 32 mm rod diameter) (see section 3.2)	
Travel	Up to 60 mm	Up to 180 mm	Up to 60 mm	Up to 180 mm
Mounting kit order no.	1400-6713 (lever I)	1400-6714 (lever II)	1400-6713 (lever I) plus 1400-5342	1400-6714 (lever II) plus 1400-5342
Accessories for attachment to Type 4763 and Type 4765 Positioner (see section 3.4)				
Mounting kit order no.	1400-6710			
Accessories for attachment to Type 3351 Valve (see section 3.2)				
Nominal size	DN 15 to 50		DN 65 to 100	
Mounting kit order no.	1400-6585		1400-6586	
Accessories for attachment to Type 3591 Valve with lever II (see section 3.3)				
Mounting kit order no.	1402-0662			

2.5 Summary of explosion protection approvals

Type	Certificate		Type of protection
4746		Number IEx 13.0040 Date 17.05.2013 Valid until 16.05.2016	Ex ia IIC T Gb
	STCC	Number No.977 Valid until 01.10.2017	0Ex ia IIC T6X 2Ex s II T6X
4746-1		Number RU C.DE.08.00744 Date 27.01.2015 Valid until 26.01.2020	1Ex ia IIC T6/T5/T4 Gb X
		Number 3-KB4BO-0038 Date 31.01.2013 Valid until 31.01.2016	Ex ia IIC T6/T5/T4
4746-12	CCoE (on request)		
		Number GYJ15.1221 Date 16.06.2015 Valid until 15.06.2020	Ex ia IIC T4~T6 Gb

Type	Certificate	Type of protection
4746-1x	 <p>Number PTB 98 ATEX 2114 Date 07.03.2003</p> <p>EC type examination certificate</p>	II 2G Ex ia IIC T6 Gb
4746-3	 <p>Number 1607226 Date 16.09.2005</p>	Ex ia IIC T6; Class I, Zone 0; Class I,II, Div.1, Groups A,B,C,D,E,F,G; Class I,II, Div.2, Groups A,B,C,D,E,F,G;
4746-32 4746-33	 <p>Number 3020228 Date 28.02.2005</p>	Class I, Zone 0 AEx ia IIC Class I,II,III; Div.1, Groups A,B,C,D,E,F,G Class I, Div.2, Groups A,B,C,D; Class II, Div.2 Groups F,G; Class III;
4746-8	 <p>Number RU C.DE.08.00744 Date 27.01.2015 Valid until 26.01.2020</p>	2Ex nA IIC T6/T5/T4 Gc X 2Ex ic IIC T6/T5/T4 Gc X
4746-82	 <p>Number GYJ15.1222X Date 16.06.2015 Valid until 15.06.2020</p>	Ex ic IIC T4~T6 Gc Ex nA IIC T4~T6 Gc
	 <p>Statement of conformity</p> <p>Number PTB 02 ATEX 2012 X Date 05.04.2002</p>	II 3G Ex nA II T6
4746-83	 <p>Statement of conformity</p> <p>Number PTB 02 ATEX 2012 X Date 05.04.2002</p>	II 3G Ex nA II T6

3 Attachment to the valve

The accessories listed in section 2.4 are required for attachment.

- ➔ The lever (I or II) must be installed before the limit switch is attached to the control valve. To do so, slide the lever clamping plate (1.1) over the lever (1) and slip them onto the shaft (2). Tighten the fastening screw (1.2).

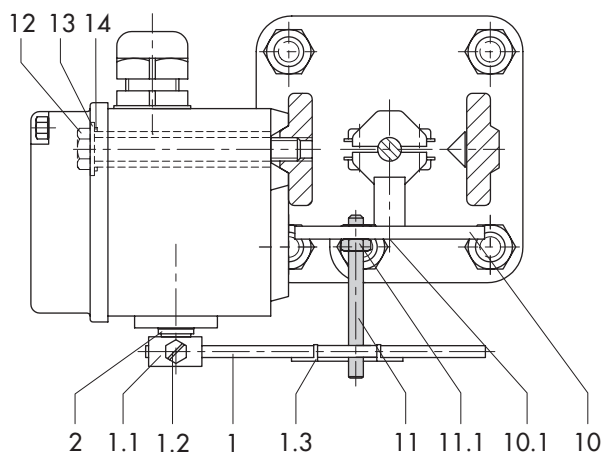
3.1 Attachment to valve with cast yoke

1. Attach the plate (10) to the valve's stem connector using two screws (10.1).
2. Attach the pin (11) to the plate (10) using two nuts (11.1).
3. Unscrew the cover of the limit switch. Attach the limit switch to the valve yoke using the mounting screw (12), washer (13) and O-ring (14).
Make sure that the pin (11) is inserted through the wire strap (1.3) of the lever (1).

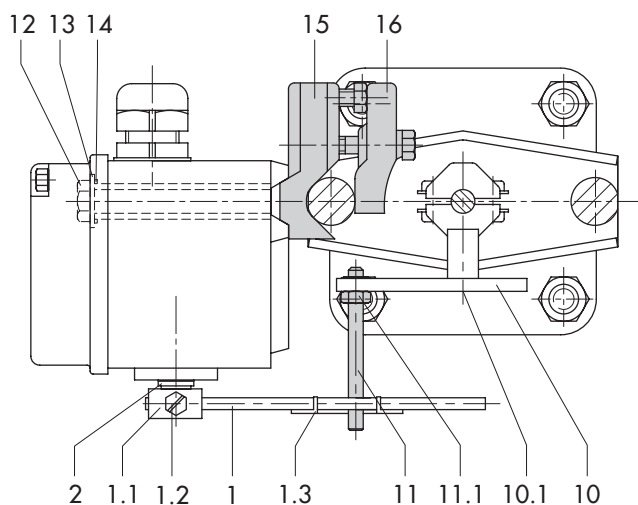
3.2 Attachment to valve with rod-type yoke

1. Attach the plate (10) to the valve's stem connector using two screws (10.1).
2. Attach the pin (11) to the plate (10) using two nuts (11.1).

3. Fasten the support (15) and the rod clamping plate (16) loosely to the rod.
In the valve travel mid-position, move the support until the center of the plate (10) and the support (15) are aligned.
 4. Fasten the rod clamping plate.
 5. Attach the limit switch to the support using the mounting screw (12), washer (13) and O-ring (14). Make sure that the pin (11) is inserted through the wire strap (1.3) of the lever (1).
- ➔ After attaching the limit switch, make sure that the vent plug of the housing cover faces downward when the valve is installed.



Attachment to valve with cast yoke (NAMUR rib)



Attachment to valve with rod-type yoke

- 1 Lever
- 1.1 Clamping plate
- 1.2 Screw
- 1.3 Wire strap
- 2 Shaft
- 10 Plate
- 10.1 Screws
- 11 Pin
- 11.1 Nuts
- 12 Screw
- 13 Washer
- 14 O-ring
- 15 Support
- 16 Rod clamping plate

Fig. 2: Attachment to the valve

3.3 Attachment to Type 3591 Valve

- ➔ Use the supplied washers for all screw connections.
- 1. Fasten the round brackets (1) using the clamps (3) and nuts (2) lightly onto the valve yoke.
- 2. Screw tight the bar (4) using the screws (5) onto the clamps (3).
- 3. Fasten the limit switch (6) onto the bar (4) as described in step 3 of section 3.1. Use the thread (7) in the bar.
- 4. Fasten the mounting bracket (9) using the screws (10) to the anti-rotation fixture (8) of the valve.
- 5. Screw the follower clamp (11) to the mounting bracket (9) using the nut and bolt (12).
- 6. Insert the pin (13) into the oblong hole of the follower clamp (11). Make sure that the pin is inserted through the wire strap of the follower clamp.
- 7. Thread the nut (14) onto the pin (13). Place the clamp (16) over the lever (15) of the limit switch (6).
- 8. Use the nut (17) to fasten the lever (15) onto the lever extension (18).
- 9. Fasten the other end of the lever extension (18) to the follower clamp (11).
- 10. Perform alignment.

The following applies concerning attachment:

- ➔ Perform the alignment in such a way that the lever (15), lever extension (18) and oblong hole of the follower clamp (11) are in line with each other.
- ➔ After attaching the limit switch, make sure that the vent plug of the housing cover faces downward when the valve is installed.

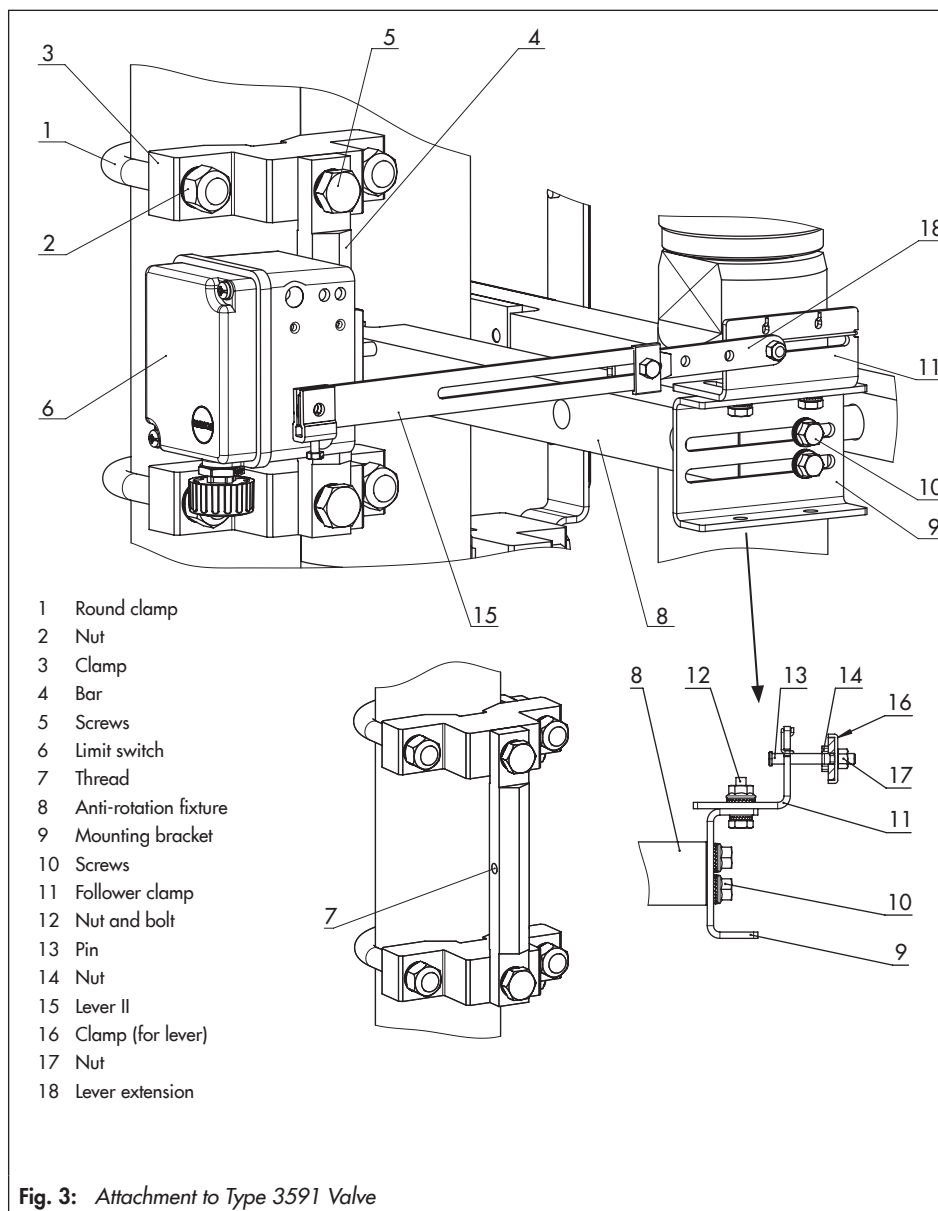


Fig. 3: Attachment to Type 3591 Valve

3.4 Attachment to positioner

For attachment of the limit switch to the Type 4763 or 4765 Positioner according to Fig. 4, a short lever (1) and an intermediate piece (31) are required as accessories (order no. 1400-6710).

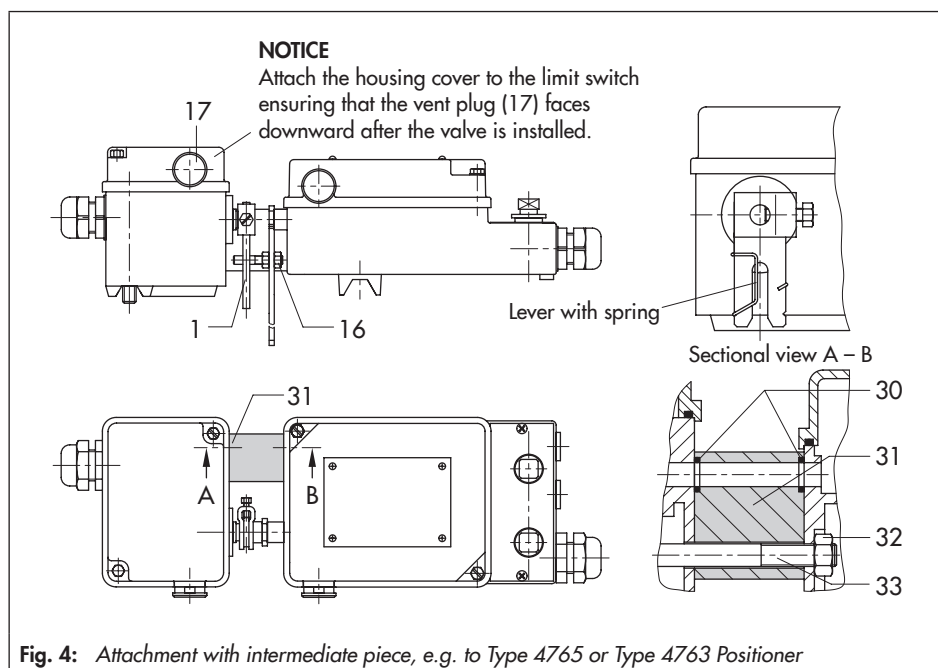
1. Insert one O-ring (30) into both the left and the right side of the intermediate piece (31).
2. Push the two fillister head screws (33) through the limit switch and intermediate piece, and insert them into the positioner.
3. Insert the nuts (32) into the positioner housing and screw tight the two fillister head screws (33).

Make sure that the short lever (1) slides over the pin (16) of the positioner.

4. Replace the vent plug (17) in the positioner housing with the screw plug included in the accessories (order no. 1400-6710).

In exchange, insert the vent plug into the housing of the limit switch. This ensures that the degree of protection of the limit switch corresponds to that of the positioner.

- To achieve degree of protection IP 65, a check valve (order no. 1790-7408) needs to be installed in the housing of the limit switch.



4 Connections

4.1 Electrical connection



DANGER!

For electrical installation, observe the relevant electrotechnical regulations and the accident prevention regulations that apply in the country of use. In Germany, these are the VDE regulations and the accident prevention regulations of the employers' liability insurance.

The following regulations apply to installation in hazardous areas: EN 60079-14:2008 (VDE 0165, Part 1) Explosive Atmospheres – Electrical Installations Design, Selection and Erection.



NOTICE

Adhere to the terminal assignment! Switching the assignment of the electrical terminals may cause the explosion protection to become ineffective. Do not loosen enameled screws in or on the housing. The maximum permissible values specified in the EC-type examination certificates apply when interconnecting intrinsically safe electrical equipment.

(U_i and U_0 , I_i and I_0 , P_i and P_0 , C_i and C_0 as well as L_i and L_0)



Note on the selection of cables and wires:

Observe clause 12 of EN 60079-14 (VDE 0165, Part 1) for installation of the intrinsically safe circuits.

Clause 12.2.2.7 applies when running multi-core cables and wires with more than one intrinsically safe circuit.

The radial thickness of the insulation of a conductor for common insulating materials (e.g. polyethylene) must not be smaller than 0.2 mm. The diameter of an individual wire in a fine-stranded conductor must not be smaller than 0.1 mm. Protect the conductor ends against splicing, e.g. by using wire-end ferrules.

When two separate cables are used for connection, an additional cable gland can be installed. Seal cable entries left unused with plugs. Fit equipment used in ambient temperatures below $-20\text{ }^{\circ}\text{C}$ with metal cable entries.



Note concerning equipment for use in zone 2:

In equipment operated according to type of protection Ex nA II (non-sparking equipment) according to EN 60079-15:2003, circuits may be connected, interrupted or switched while energized only during installation, maintenance or repair.

Equipment connected to energy-limited circuits with type of protection Ex nL (energy-limited equipment) according to EN 60079-15:2003 may be switched under normal operating conditions. The maximum permissible values specified in the statement of conformity or its addenda apply when interconnecting the equipment with energy-limited circuits in type of protection Ex nL IIC.

Cable entry

The cables for the electric control signal must be routed through the cable gland on the housing and connected to the input terminals marked + and – as illustrated in Fig. 5 or according to the adhesive label on the inside of the cover.

The following accessories are available:

Cable gland M20 x 1.5:

Black plastic, with washer

Order no. 8808-0180

Blue plastic, with washer

Order no. 8808-0181

Nickel-plated brass Order no. 1890-4875

Adapter M20x1.5 to ½ NPT:

Powder-coated aluminum

Order no. 0310-2149

Device index .06 and lower

Black plastic Order no. 8808-0178

Blue plastic Order no. 8808-0179

4.1.1 Switching amplifier for Type 4746-x2

For operation of the inductive limit switches, switching amplifiers in accordance with EN 60947-5-6 have to be connected in the output circuit (not for Type 4746-0281). Observe the relevant regulations for installation in hazardous areas.

4.2 Pneumatic connection for Type 4746-04

The air connections are tapped holes with G ⅛ ISO 228 or ⅛-27 NPT thread.

Customary fittings for metal tubing or plastic hoses can be used.

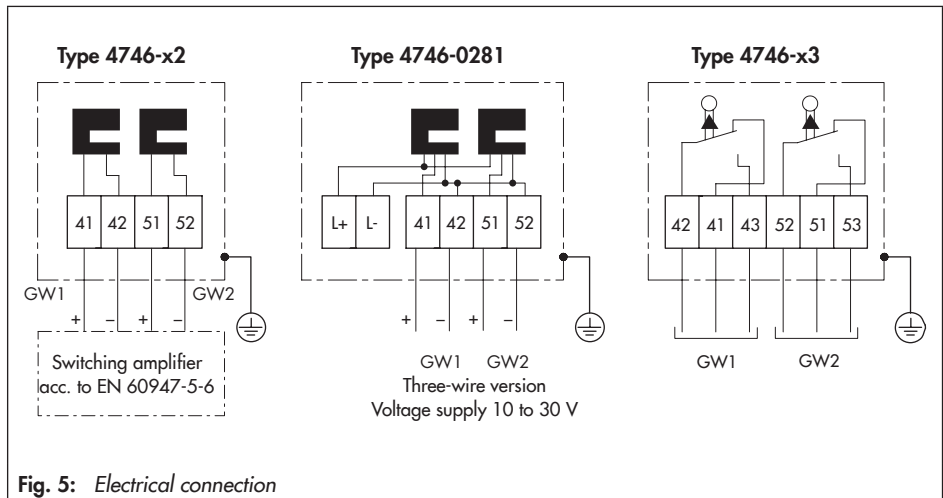


Fig. 5: Electrical connection

5 Operation

5.1 Adjusting the switching point

The limit switches attached to control valves are usually adjusted in such a way that a signal is issued when the final travel positions are reached. Optionally, the switching point can also be adjusted to any position within the travel range, e.g. if an intermediate position is to be indicated.

The adjusted switch positions can be recorded on the supplied adhesive labels marked A, B and C, and assigned to the corresponding switching elements.

5.1.1 Type 4746-x2

- Move the valve to the switching position and turn the adjustment screw (3.1) until the metal tag (4.1) reaches the switching point.
- Always move the valve to the final travel positions from an intermediate position on adjusting or checking the switching point!

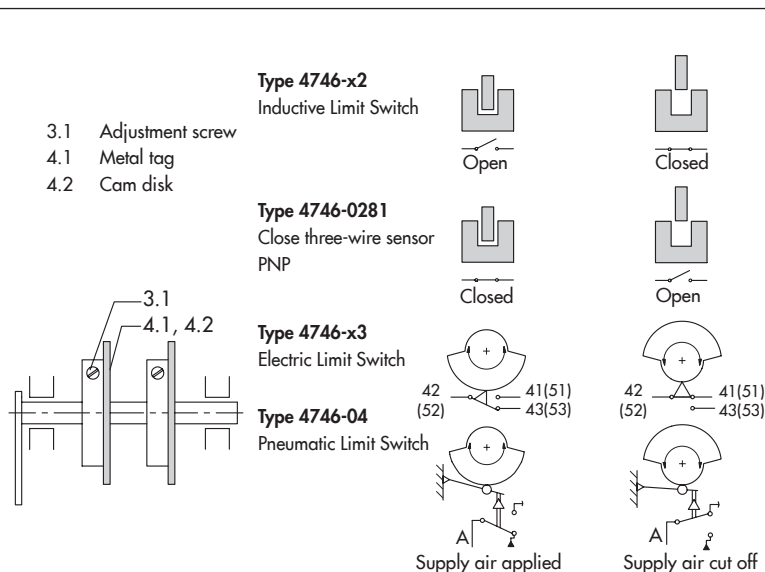


Fig. 6: Limit contacts

**Note:**

The switching elements and the levers required to activate them react to temperature fluctuations. To ensure reliable switching, the switching hysteresis between the mechanical stop (e.g. plug in the seat) and the switching point of the limit switch must be larger than the displacement of the switching point caused by the temperature change.

Distance between switching points for 100 mm lever:

Contact SC3,5-N0-YE ≥ 2 mm,

Contact SJ3,5-SN ≥ 0.75 mm.

With other lever lengths, adjust the switching point to the changed lever length.

For example, if the lever length changes from 100 to 160 mm, the distance between the switching points is increased from 2.0 to 3.2 mm correspondingly.

Simplified adjustment of the inductive limit switches:
Valve CLOSED:

Close the valve until the plug sits in the seat.

Valve OPEN:

Move the valve to the desired travel position, e.g. final position.

- Turn the adjustment screw (3.1) to slowly move the metal tag (4.1) towards the contact until the switching point is reached.

- Turn the adjustment screw in the opposite direction to achieve that the switching point reaches the stop after
- contact SC3,5-N0-YE $\geq \frac{1}{6}$ turn
- contact SJ3,5-SN $\geq \frac{1}{16}$ to $\frac{1}{10}$ turn

If the adjustment is performed carefully, the distances between the switching points specified above apply.

5.1.2 Type 4746-x3 and Type 4746-04

➔ For adjustment, the cam disk (4.2) has to be positioned in such a way that its cam moves towards the roller (6.1, Fig. 1) in accordance with the direction of travel.

1. Move the valve to the desired switching position (e.g. final travel position "valve OPEN" or "valve CLOSED").
2. Adjust the switch which is assigned to the upper or lower switching point.
3. Turn the adjustment screw (3.1) until the cam of the cam disk (4.2) reaches the roller (6.1, Fig. 1) and the switch changes over.
4. To accurately check the switching point, move the valve slightly back and then move it to the switching position again.

6 Servicing explosion-protected devices

If a part of the device on which the explosion protection is based needs to be serviced, the device must not be put back into operation until a qualified inspector has assessed it according to explosion protection requirements, has issued an inspection certificate or given the device a mark of conformity.

Inspection by a qualified inspector is not required if the manufacturer performs a routine test on the device prior to putting it back into operation. Document the passing of the routine test by attaching a mark of conformity to the device.

Replace explosion-protected components only by original, routine-tested components provided by the manufacturer.

Devices that have already been used outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed on serviced devices. Before being operated inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

7 Maintenance and calibration

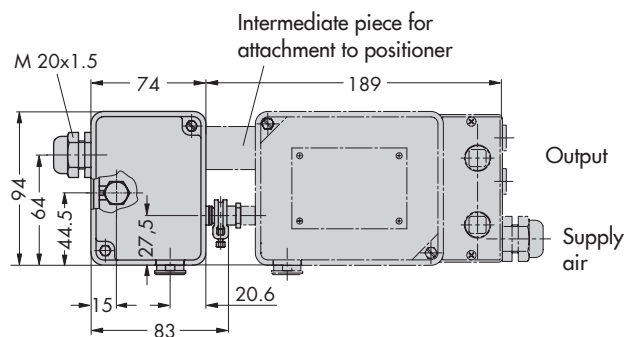
Interconnection with intrinsically safe circuits to check or calibrate the equipment inside or outside hazardous areas is to be performed only with intrinsically safe current/voltage calibrators and measuring instruments to rule out any damage to components relevant to explosion protection.

→ Observe the maximum permissible values specified in the certificates for intrinsically safe circuits.

8 Dimensions

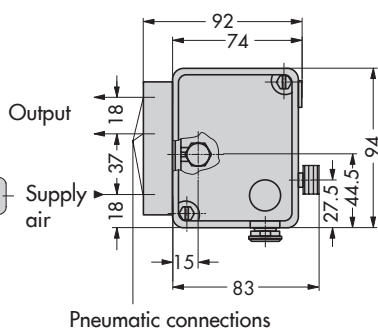
Type 4746-x2 and Type 4746-x3

Air connection for separate air supply,
tapped hole G $\frac{1}{8}$



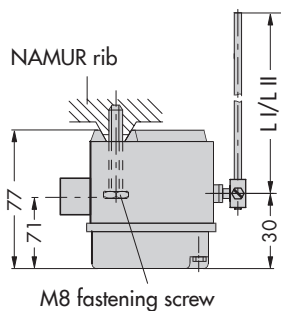
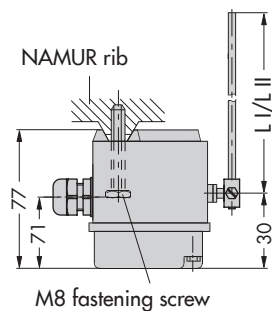
Type 4746-04

Air connections, tapped hole G $\frac{1}{8}$
or $\frac{1}{8}$ NPT



Lever length L I/L II

Lever I: 149 mm
Lever II: 202 mm



9 Certificates



Note:
The type designations of the Types 4746-2 and 4746-3 Limit Switches have been changed. The certificates of conformity remain valid. See the following confirmation for details.

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

Telefax

an / to

Bitte sofort weiterleiten! Please pass on immediately!

Fa. SANSON AG Mess- und Regeltechnik
E 71
Herrn Pflug
Weismüllerstr. 3
60314 Frankfurt
Telefax: 069 4009 1765
von / from
Org.-Einh. / Org Unit:
3.42
Herrn Pflug
Telefax Org.-Einh. / Org Unit: 592 - 34 05
e-mail: hartmut.bienmueller@ptb.de
Bemerkungen / Remarks: EG-Baumusterprüfbescheinigung PTB 98 ATEX 2114 für Grenz-signalgeber Typen 4746-...

Sehr geehrter Herr Pflug,
bezogen auf unser heutiges Telefonat bestätige ich Ihnen die folgenden Änderungen:
Der Typenschlüssel für die Grenzsignalgeber 4746-... hat sich geändert.
Die Gegenüberstellung der Typen ist der folgenden Tabelle zu entnehmen:

Ausführung / Typ	alt	neu
Grenzsignalgeber induktiv	4746-2..	4746-12.
Grenzsignalgeber elektrisch	4746-3..	4746-13.

Bezogen auf die Zündschutzart "Eigensicherheit" von elektrischen Betriebsmitteln bestehen keine Bedenken, den Typenschlüssel in der vorgeschlagenen Weise zu modifizieren.
Die Änderungsmitteilung verbleibt bei den Unterlagen der EG-Baumusterprüfbescheinigung.
Ein Antrag auf Ergänzung ist nicht erforderlich.

Mit freundlichen Grüßen
Im Auftrag

Rückfragen bei fehlerhafter Übermittlung / In the case of faulty reproduction, please call: (0531) 592 34 01

TRANSLATION

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

(Symbol)

EC TYPE EXAMINATION CERTIFICATE

(EX) II 2 G EEX Ia IIC T6

(1) Equipment and Protective Systems Intended for Use in Potentially
Explosive Atmospheres – Directive 94/9/EC

(2) EC Type Examination Certificate Number

PTB 98 ATEX 2114

(3) Equipment: Model 4746-2 and 4746-3 Limit Switches

(4) Manufacturer: Samson AC

(5) Address: Weismüllerstr. 3, D-60314 Frankfurt

(6) This equipment and any acceptable variations thereof is specified in
the schedule to this certificate and the documents referred to therein.

(7) The Physikalisch-technische Bundesanstalt, certified body number 0102
in accordance with Article 9 of the Council Directive 94/9/EC of 23 March
1994, certifies that this equipment has been found to comply with the
Essential Health and Safety Requirements relating to the design and
construction of equipment and protective systems intended for use in
potentially explosive atmospheres specified in Annex II to the Directive.

The examination and test results are recorded in confidential report
No. PTB EX 98-28184.

(8) Compliance with the Essential Health and Safety Requirements has
been assured by compliance with

EN 50014: 1997 EN 50020: 1994

(9) If the sign "X" is placed after the certificate number, it indicates that
the equipment is subject to special conditions for safe use specified in
the schedule to this certificate.

(10) According to the Directive 94/9/EC, this EC TYPE EXAMINATION
CERTIFICATE relates only to the design and construction of the specified
equipment. If applicable, further requirements of this Directive apply
to the manufacture and supply of this equipment.

(11) The marking of the equipment shall include the following:

Zertifizierungsstelle Explosionsschutz Braunschweig, 03.09.1998
By order

(Signature) (Seal)

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in its entirety
and without any changes, schedule included.

Extracts or changes shall require the prior approval of the Physikalisch-
Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin



TRANSLATION

ADDENDUM No.: 1

in compliance with Directive 94/9/EC Annex III Clause 6
to the EC Type Examination Certificate PTB 98 ATEX 2114

Equipment: Model 4746-12.. and 4746-13.. Limit Switches

Marking: II 2 G EEx Ia IIC T6

Manufacturer: SAMSON AG

Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

Description of the additions and modifications

The model description code has been changed. The old and the new designation code numbers are shown in the table below:

Old	New
4746-2..	4746-12..
4746-3..	4746-13..

In future, also the Model SJ-3.5 Slot-type Proximity Switches manufactured by Pepperl & Fuchs approved under the EX Type Examination Certificate PTB 99 ATEX 22189 X may be used.

The preceding models of the same name approved under the Certificate of Conformity PTB No. Ex-95 D-2195 X are permitted to be used until 20 June 2002.

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate is valid only for the products and scope of use specified in the schedule included.
Extensions or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

Plb08 Add-1.doc

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

PTB

Addendum No. 1 to the Ex Type Examination Certificate PTB 98 ATEX 2114

Electrical data

Models 4746-12../1../2 with inductive proximity switch

Inductive proximity switch
(terminals 41/42 and 51/52)

Type of Protection: Intrinsic Safety EEx ia IIC
only for connection to a certified intrinsically safe circuit

Maximum values	U _i = 16 V	I _i = 52 mA	P _i = 169 mW	or
	U _i = 16 V	I _i = 25 mA	P _i = 64 mW	
	C _i = 50 nF			
	L _i = 230 µH			

The correlation between temperature classification, permissible ambient temperature ranges, maximum short-circuit currents and power for evaluating instruments is shown in the table below:

Temperature class	Permissible ambient temperature range	I _o / P _o
T6	-45 °C ... 45 °C	
T5	-45 °C ... 60 °C	52 mA/169 mW
T4	-45 °C ... 80 °C	
T6	-45 °C ... 60 °C	
T5	-45 °C ... 80 °C	25 mA/64 mW
T4	-45 °C ... 100 °C	

All the other electrical data and other data apply also to this Addendum No. 1.

Test report: PTB EX 03-23049

Zertifizierungsstelle Explosionsschutz

Braunschweig, 7 March 2003

By order
(Signature)

(Seal) Dr. Ing. U. Johannsmeyer
Regierungsdirektor

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate is valid only for the products and scope of use specified in the schedule included.
Extensions or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

Plb08 Add-1.doc



TRANSLATION

- (1) **Statement of Conformity**
- (2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**
- (3) EC Type Examination Certificate Number **PTB 02 ATEX 2012 X**
- (4) Equipment: Model 4746-8 . . . Limit Switch
- (5) Manufacturer: SAMSON AG Mess- und Regeltechnik
- (6) Address: Weismüllerstr. 3, 60314 Frankfurt am Main, Germany
- (7) The equipment and any acceptable variation thereof are specified in the schedule to this certificate and the documents referred to therein.
- (8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 according to Article 9 of the Council Directive 94/9/ of 23 March 1994, certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres specified in Annex II to the Directive.
- The examination and test results are recorded in confidential report.

PTB Ex 02-21299

- (9) The essential health and safety requirements are satisfied by compliance with

EN 50021: 1999

- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use as specified in the schedule to this certificate.

- (11) In compliance with the Directive 94/9/EC this Statement of Conformity relates only to the design and construction of the equipment specified. Further requirements of this Directive apply to manufacture and marketing of this equipment.

- (12) The marking of the equipment shall include the following:



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

(13)

Schedule

(14)

Statement of Conformity PTB 02 ATEX 2012 X

(15)

Description of Equipment

The Modell 4746-8 ... Limit Switch is used to convert mechanically produced manipulated variables into electrical signals. It is intended for attachment to pneumatic, electrical or hydraulic controlling equipment installed inside or outside of hazardous areas.

The electrical connection is made by plug connectors or cable entries.

The correlation between temperature classification and permissible ambient temperature range is shown in the table below:

Temperatur class	Ambient temperature range
T5	-45°C ... +70°C
T6	-45°C ... +60°C
T4	-45°C ... +80°C

Electrical data

Versions:

- a.) With inductive limit switch
Contact circuit
(terminals 41/42, 51/52)

Type of protection EEx nA II
- b.) With electrical limit switch
Contact circuit
(terminals 41/42/43, 44/45/46,
51/52/53)

Type of protection EEx nA II

(16) Test report PTB Ex PTB 02-21299

(17) Special conditions for safe use

The Modell 4746-8 ... Limit Switch shall be installed in an enclosure providing at least Degree of Protection IP 54 in compliance with IEC Publication 60529.

The wiring shall be connected in such a manner that the connection facilities are not subjected to tensile and/or torsional stress.

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

Schedule to the Statement of Conformity PTB 02 ATEX 2012 X

(18) Basic health and safety requirements

Are satisfied by compliance with the standard specified...

Zertifizierungsstelle Explosionsschutz Braunschweig,

By order

(Signature) (seal)

Dr.-Ing. U. Johannsmeyer
Regierungsdirektion

Statements of Conformity without signature and seal are invalid. This Statement of Conformity may be reproduced only in full and without any changes. Reproduction or translation into other languages without the prior approval of the Physikalisch-Technische Bundesanstalt. Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt Bundesallee 100 D-38116 Braunschweig

Installation Manual for apparatus certified by CSA for use in hazardous locations.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values of limit switches circuit

	Ui or Vmax	Ii or Imax	Pi or Pmax	Ci	Li
inductive	16V	25/52mA	64/169mW	60nF	250µH
electrical	28V	116mA	2 W	0 nF	0 µH

Ui or Vdc ≤ Ui or Vmax / Ii or Iac ≤ Ii or Imax / Po ≤ Pi or Pmax; Ci ≥ Ci and Li ≥ Li

Table 2: CSA - certified barrier parameters of electrical limit switch circuits

Barrier	Supply barrier		Evaluation barrier	
	Vmax	Rmin	Vmax	
electrical	≤ 28V	≥ 280Ω	≤ 28V	Diode Return

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	-45°C ... 60°C
T5	-45°C ... 70°C
T4	-45°C ... 80°C

Table 4: For the Model 4746 - 3 Limit Switch the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below:

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-45°C ... 45°C	
T5	-45°C ... 60°C	52mA
T4	-45°C ... 75°C	
T6	-45°C ... 60°C	
T5	-45°C ... 80°C	25mA
T4	-45°C ... 80°C	

Intrinsically safe if installed as specified in manufacturer's installation manual.

CSA - certified for hazardous locations

Ex Ia IIC T6; Class I, Zone 0

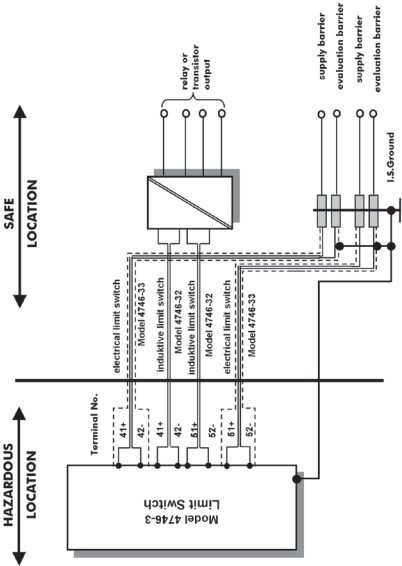
Class I; Groups A, B, C, D

Class II; Groups E, F + G; Class III

Type 3 or 4 Enclosure

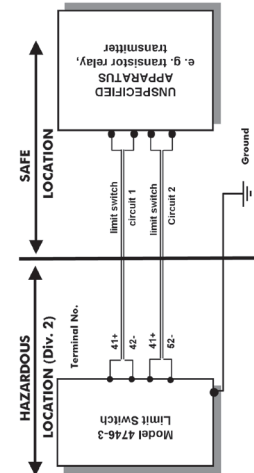
Notes:

- 1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the CSA certified apparatus. For maximum values of Ui or Vmax; Ii or Imax; Pi or Pmax; Ci and Li of the various apparatus see Table 1.
- 2.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the CSA certified intrinsically safe barrier. For barrier selection see Table 2.
- 3.) The installation shall be in accordance with the C. E. C. Part 1.
- 4.) Each pair of I.S. wires shall be protected by a shield that is grounded at the I.S. Ground. The shield shall extend as close to the terminals as possible.
- 5.) Use only supply wires suitable for 5°C above ambient temperature.



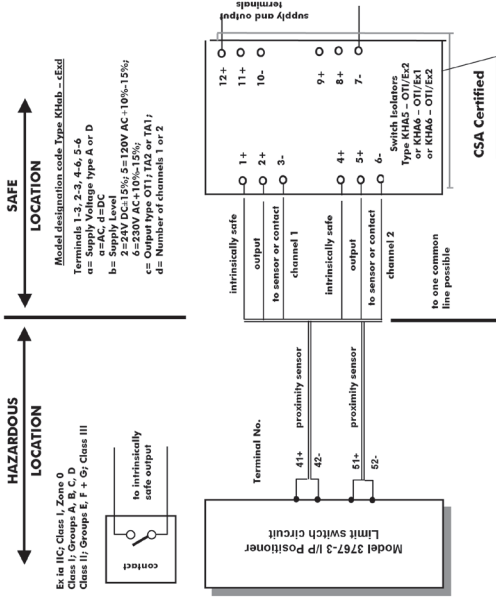
Version: Model 4746-33 Electrical Limit Switch. Supply and evaluation barrier CSA- certified.

CSA- certified for hazardous locations
Class I; Div. 2, Groups A, B, C, D
Class II; Div. 2, Groups E, F + G, Class III
Type 3 Enclosure



- Notes:**
- 1.) For the maximum values for the individual circuits see Table 1 and 2.
 - 2.) Cable entry M 20 x 1.5 metal conduit according to drawing No. 1050-0539 T and 1050-0540 T

Addendum Page 4
Installation drawing Control Relay KHA5-OTI/Ex2, KHA6-OTI/Ex1 or KHA6-OTI/Ex2 with Model SJ-b-N Proximity Sensors



The total series inductance and shunt capacitance of shield wiring shall be restricted to the following maximum values

System parameters

Control Relay Terminal No.	Groups	L [mH]	C [pF]	V _{OC} [V]	I _{SC} [mA]	V _{max} [V]	R _{min} [Ω]
1, 2, 2-2, 4-4, 5-6	A + B	84.88	1.273	12.6	19.8	12.6	650
	C + D	298.7	3.82	12.6	19.8	12.6	650
	E, F, G	744.4	10.18	12.6	19.8	12.6	650

Division 2 wiring method shall be in accordance to the Canadian Electrical Code Part 1.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values

	U _i or V _{max}	I _i or I _{max}	P or P _{max}	C _i	L _i
Limit switches (inductive)	16V	25/52mA	64/168mW	60nF	250 µH
Limit switches (electrical)	28V	115mA	2 W	0nF	0 µH

Notes: U_i or V_{oc} or V_i ≤ U_i or V_{max} / I_i or I_{oc} or I_i ≤ I_i or I_{max}
P_i or P_{max} ≤ P or P_{max}

Table 2: FM - approved barrier parameters of electrical limit switch circuits

Barrier	Supply barrier			Evaluation barrier			
	V _{oc}	R _{in}	I _{oc}	P _{max}	V _{oc}	R _{in}	I _{oc}
Limit switches (electrical)	≤ 28V	≥ 98Ω	≤ 115mA	≤ 2W	≤ 28V	#	0mA

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	60°C
T5	- 45°C ≤ t _a ≤ 70°C
T4	80°C

Revisions Control Number: 1 August 2004

Addendum to EB 8365 EN

Revisions Control Number: 1 August 2004

Addendum to EB 8365 EN

Table 4: For the Model 4746 – 3 Limit Switch the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below:

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	45°C	52mA
T5	- 45°C ≤ t _a ≤ 60°C	
T4	75°C	
T6	60°C	25mA
T5	- 45°C ≤ t _a ≤ 80°C	
T4	80°C	

Intrinsically safe if installed as specified in manufacturer's installation manual.

FM - approved for hazardous locations

Class I, Zone 0 A Ex ia IIC T6,
Class I, II, III, Division 1, Groups A, B, C, D, E, F + G

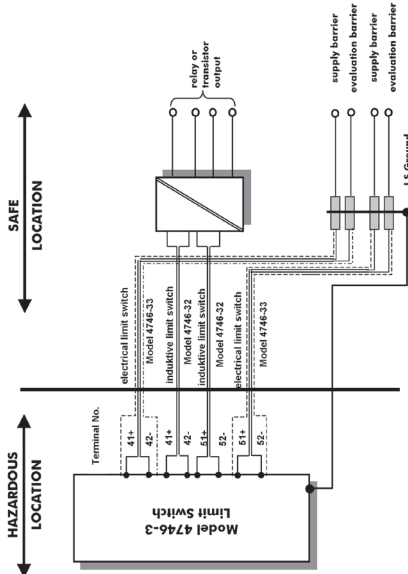
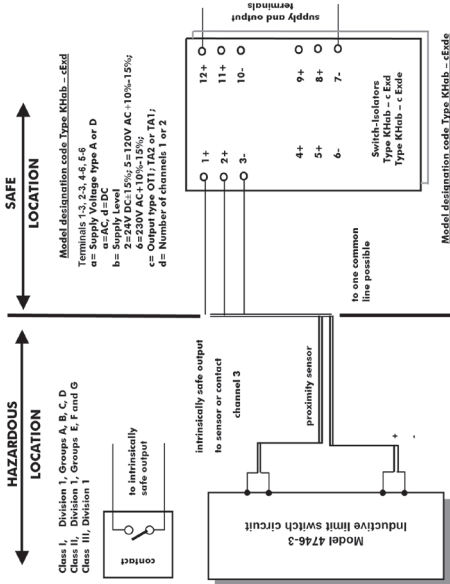
NEMA 3R

Notes:

- 1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM approved apparatus.
For maximum values of U_i or V_{max} ; I_i or I_{max} ; P or P_{max} ; C_i and L_i of the various apparatus see Table 1.
- 2.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM approved intrinsically safe barrier.
For barrier selection see Table 2.
- 3.) The installation shall be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01.
- 4.) Safety Barrier shall be FM-Approved. Each pair of I.S. wires shall be protected by a shield that is grounded at the I.S. Ground. The shield shall extend as close to the terminals as possible.
- 5.) Use only supply wires suitable for 5°C above ambient temperature.

- Notes:
- 1.) For the maximum values for the individual circuits see Table 1 and 2.
 - 2.) Cable entry M 20 x 1.5 metal conduit according to drawing No. 1050-0539 T and 1050-0540 T
 - 3.) The installation shall be in accordance with the National Electrical Code ANSI/NFPA 70

Installation drawing Control Relay Hab – cEx de with Model SJ-b-N Proximity Sensors



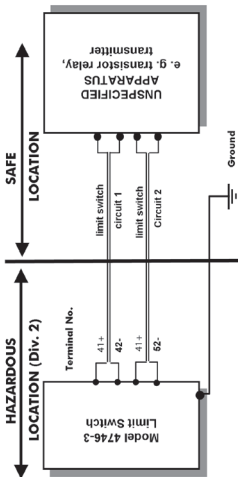
Version: Model 4746-33 Electrical Limit Switch. Supply and evaluation barrier FM approved.

Cable entry M 20 x 1.5 or metal conduit according to drawing No. 1050 – 0539 T or 1050 – 0540 T

FM- approved for hazardous locations

Class I, Division 2, Groups A, B, C, D
Class II Division 2, Groups F + G, Class III

NEMA 3R



Revisions Control Number: 1 August 2004

Addendum to EB 8365 EN

Revisions Control Number: 1 August 2004

Addendum to EB 8365 EN

Manufacturer Declaration

made out to:
BASF Aktiengesellschaft, Carl-Bosch-Str. 38, D- 67056 Ludwigshafen

Pepperl+Fuchs GmbH Mannheim declares in its sole responsibility that the products named as above are manufactured following the standard EN 50 021: 1999.

types:
inductive sensors FJ..., NB..., NC..., NJ..., RG..., RJ..., TG..., SC..., SJ...,
capacitive sensors CB..., CC..., CJ...,

Applies only to sensors that have an EC-Type Examination Certificate according Directive 94/9/EC category 2G or 1G.

Pepperl+Fuchs GmbH Mannheim declares in its sole responsibility that the above mentioned sensors are according to the requirements of Zone 2.
The type of protection is

II 3G EEx nL IIC T6

conform to standard EN5021:1999
The sensors are not marked with II 3G EEx nL IIC T6.
The sensors are marked according to the EC-Type Examination Certificate category 2G or 1G.

The sensors have to be connected to energy-limited circuits only with type of protection EEx nL.
The values of the equivalent internal resistances C and L and the maximum permissible ambient temperature are given in the EC-Type Examination Certificate category 2G.

The maximum permissible ambient temperature has to be taken from the temperature table, which is subdivided into different types and temperature classes, of the assigned EC-Type Examination Certificate. P. use given in the following table (type 4 only if this type is listed in the assigned EC-Type Examination Certificate).

	type 1	type 2	type 3	type 4
U	20V	20V	20V	20V
I	25 mA	25 mA	50 mA	75 mA
P	34 mW	64 mW	180 mW	242 mW

The special conditions of the EC-Type Examination Certificate category 2G and the instructions according category 2G have to be taken into account.

For use according to Directive 94/9/EC within the European Community the manufacturer declaration is not sufficient because the following requirements of the Directive 94/9/EC are not met: marking on the sensor, instruction, declaration of conformity.

Pepperl+Fuchs Mannheim is subject to the rules of a quality management system according to DIN EN ISO 9001



Signature of Manufacturer: I.A. Werninger
Function of the signat: Head of EMS
factory automation
date: 2003-05-14



SAMSON AG · MESS- UND REGELTECHNIK
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Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
samson@samson.de · www.samson.de

EB 8365 EN

2015-08-28 · English